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The domain dependence of chemotaxis in two-dimensional turbulence[1] WENBO TANG, KIMBERLY JONES, PHILLIP WALKER, Arizona State University — Coherent structures are ubiquitous in environmental and geophysical flows and they affect reaction-diffusion processes in profound ways. In this presentation, we show an example of the domain dependence of chemotaxis process in a two-dimensional turbulent flow. The flow has coherent structures that form barriers that prohibit long-range transport of tracers. Accordingly, the uptake advantage of nutrient by motile and nonmotile species differs significantly if the process start in different locations of the flow. Interestingly, the conventional diagnostic of Finite-time Lyapunov exponents alone is not sufficient to explain the variability — methods to extract elliptic transport barriers are essential to relate to the explanation. We also offer some explanations of the observed scalar behaviors via analyses of bulk quantities.

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